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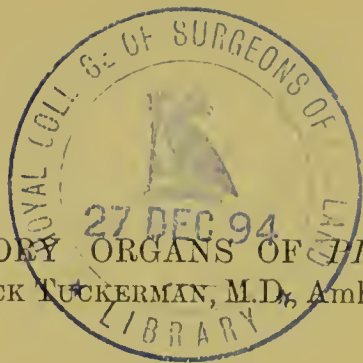
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THE GUSTATORY ORGANS OF *PROCYON LOTOR*.

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(PLATE X.)



General Appearance of the Tongue.—The tongue of *Procyon lotor* is 94 mm. in length, 25 mm. in width, and 15 mm. in thickness, and is free for 20 mm. from the frænum. The extreme anterior portion is relatively thin, and terminates in an obtuse apex, the latter showing a slight tendency to become bifurcate. The under surface is smooth, and marked for a short distance by a median raphé running forwards from the frænum linguæ. The raphé soon takes the form of a rather deep groove, which is continued to the apex. The papillate surface is soft and velvety to the touch, and bears the impress of the palatal furrows. It is somewhat convex posteriorly, and more or less flattened anteriorly, and presents a nearly uniform breadth throughout. The anterior dorsal surface is impressed by a faint trace of a mesial raphé, perceptible for about 25 mm. from the tip backwards. The lateral borders, particularly in the fore part of the organ, are marked by a fringe of delicate cone-shaped papillæ, the points of which are directed upwards, backwards, and inwards. The gustatory and extreme basal regions of the tongue have the usual coarse, fleshy, recurved papillæ projecting from the surface. Fungiform papillæ of the normal type are numerous, and quite uniform in their distribution, those of the mid-dorsal region being the most conspicuous. The circumvallate papillæ, seven to ten in number, are placed in two rows, converging posteriorly, one on each side of the median line. They vary considerably in size, are more or less verrucose, and are frequently overtopped by an exuberantly developed fimbriated outer wall. There is a lateral gustatory organ at each side of the base of the tongue. The organs are in their usual position, but differ in their structural characters, I think, from any hitherto described. Each is marked externally by three small irregular openings, running transversely to

the long diameter of the tongue, the anterior one of the three being the most conspicuous.

The Circumvallate Papillæ.—These papillæ are verrucose or papillose on top, and their epithelial covering is somewhat imbricated in arrangement, and occasionally partly cornified. The sides of the papillæ are fairly vertical, and the trench surrounding each papilla is deep, and quite uniform in breadth. Serous glands are not abundant directly beneath the papillæ, but lie for the most part in the stroma at their sides. The ducts, in consequence of this arrangement of the glands, seldom open at the bottom of the trench, but pierce its outer limiting wall obliquely, the orifice of a duct being sometimes on a level with the opening of the trench.

The taste-bulbs are disposed around the lower lateral area of the papilla in a zone of sixteen closely placed tiers. From horizontal sections through the bulb-bearing portion of the papilla I estimated the mean number of bulbs in a tier at 100. If we allow for sixteen tiers, we shall have 1600 bulbs for each papilla. The bulbs are unequal in size, and exhibit much variation in shape. Owing to the difficulty of tracing the lateral contours of individual bulbs, it is not easy to state the exact dimensions of the typical taste-bulb of *Procyon lotor*. The mean variation in length appears to be from 0.051 to 0.060 mm., the mean breadth being 0.023 mm. A few bulbs attain a transverse diameter of 0.033 mm. In many bulbs the base is more or less elongated, whilst the peripheral end is slightly rounded, and without any visible neck.

I succeeded in obtaining some fairly good transverse sections of bulbs. In one of these, in which the bulb appeared to have been divided near the middle, I counted thirty cells, eighteen of which were grouped around the axis of the bulb, and were doubtless sensory in function.

The Lateral Gustatory Organs.—The openings of the lateral organs of taste, or *gustatory recesses*, occupy the site of the papillæ foliatæ, and doubtless represent those structures in this animal. They are readily distinguishable without the aid of a lens, and consist of three small irregular recesses or cavities in the mucous membrane, placed more or less perpendicularly to the surface, upon which they open by furrow- or slit-like

apertures. The anterior reecess is by far the largest. The two posterior reecesses are more or less rudimentary or undeveloped, and are generally devoid of bulbs. Figs. 1 and 2 represent vertical sections through different parts of the same reecess. This reecess has a depth of 1.35 mm., its greatest transverse diameter being about 1 mm. In fig. 3, two recesses, the anterior and middle, are shown. At the bottom of the recesses are usually (but not invariably) one or more ridges. The walls are quite thick, and lined with stratified pavement epithelium, similar in character to that covering the lingual surface. Serous glands are scattered through the sub-mucosa, and their ducts open into the recesses either between the bases of the ridges or at the sides at different levels.

The taste-bulbs of this region are distributed more or less irregularly over the circumference of the ridges. They also occur at the sides, and are collected into groups at the deeper part of the recesses. The largest number of bulbs visible in a single vertical section of a recess was 75. In a horizontal section I counted 120. The bulbs exhibit a marked difference in size, but average about 0.045 mm. in length and 0.021 mm. in breadth. Non-medullated nerve-fibres are abundant within the ridges, and appear to run to all parts of them.

The fungiform papillæ usually have one or more taste-bulbs embedded in the epithelium of their upper surface. The bulbs appear to traverse nearly the entire thickness of the epithelium, their apices in some cases reaching to its outermost layers. The bases of the bulbs, as a general rule, either touch the mucosa or rest in a shallow depression of it. More rarely a bulb will be entirely epithelial in position.

At the lower part of the anterior surface of the epiglottis are a number of bulb-like bodies. They measure 0.024 mm. in length and 0.021 mm. in breadth, and are entirely epithelial in position. In my specimens these structures were wanting on the posterior surface of the epiglottis (their usual place of occurrence), although in *Sciurus hudsonius* I have found them on both surfaces. In the sub-mucous portion of the epiglottis are embedded small mucous glands. Their ducts, which are more or less convoluted and wavy, pass through the mucous membrane and open on the anterior surface.

EXPLANATION OF PLATE X.

Fig. 1. Vertical section through the anterior recess of a lateral gustatory organ. At the bottom of the recess are three ridges. All of the ridges bear bulbs. *o.a.r.*, opening of the anterior recess; *r.*, ridges at the bottom of the recess; *t.b.*, the taste-bulbs; *gl.*, serous gland; *gl.*, serous gland, with its duct opening into a furrow formed by the ridge. $\times 30$.

Fig. 2. Vertical section through the same recess. At this point the opening of the recess is much narrower, and the opposed walls approach each other quite closely. The floor of the recess is invaginated upwards into a symmetrically curved ridge, which bears bulbs over the whole of its circumference. Into the space at each side of the base of the ridge the serous ducts open. *o.a.r.*, opening of the anterior recess; *r.*, ridge; *t.b.*, taste-bulb; *gl.d.*, the ducts of the serous glands. $\times 30$.

Fig. 3. Vertical section through the anterior and middle recesses of a lateral gustatory organ. The lower part of the anterior recess is nearly filled by a large bulb-bearing ridge. A serous gland partly occupies the basal portion of the ridge. The ducts of the serous glands open into the recess at different levels. *o.a.r.*, opening of the anterior recess; *o.m.r.*, opening of the middle recess; *r.*, ridge; *t.b.*, taste-bulbs; *gl.*, serous gland; *gl.d.*, ducts of the serous glands. $\times 30$.

Fig. 4. Horizontal section through the anterior recess of a lateral gustatory organ at about the widest part, showing the irregular shape of the cavity and the distribution of the taste-bulbs. Many ducts of the serous glands open into the recess at this level. *t.b.*, taste-bulbs; *gl.*, serous glands; *gl.d.*, ducts of the serous glands. $\times 50$.

In Dr Tuckerman's paper on the gustatory organs of *Belideus ariel*, in the October number, the figure 4 drawn by him was not reproduced, owing to want of room on the Plate; the descriptions on p. 88 of the text of figures 5-8 apply to figures 4-7 of the plate.

Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



